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ABSTRACT

Middle school students from The College School, a private school in Webster Groves (Missouri) have completed a class called "Caves and Crystallography." A thematic approach was used in the course in which students and teachers read books telling how caves were formed, saw movies which explained the delicate balance of life underground, made several crystals typical of the calcite formations seen in the caves, and spent 1 day a week exploring wild caves. In addition, two overnight trips were held, one of which involved spending 24 hours underground. An outline of literature, handouts, movies, written experiences, art projects, and science projects is included. (JN)

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Caves: A Course of Study

by

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CAVES: A COURSE OF STUDY

> "Like a jungle of dense growth, the cave stretched endlessly back into the far reaches of the earth, and perhaps farther back into our imaginations." (Boyd Kleen, age 11)

Middle School students from The College School, a private school in Webster Groves, Missouri, have completed a class called "Caves and Crystallography." The students and teachers read books telling how caves are formed, see movies explaining the delicate balance of life underground, and make several crystals in the classroom typical of the calcite formations seen in the caves. Besides the classroom activities, one day a week is spent exploring wild caves. The class has been to the depths of some of Missouri's darkest, wettest, and most spectacular caves.

Missouri leads the nation with over 3,000 identified caves. The many sinkholes, rock outcroppings, and disappearing streams are indicators of the surface terrain found in limestone areas rich with caves.

Just mention the word 'cave' to any of these College School students and the conversation will most likely plunge into the principles of how a cave is eroded out of the limestone, the concept of crystal formations, or an overnight within a cave which kept these sixth and seventh graders underground for twenty-four hours.

Spending the night within a cave is an exciting segment planned into the spelunkers course of study. Such experiences are not unusual at The College School

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It is a way of immersing the learner totally into his/her education. This overnight adventure is to take the explorers, with the owner's permission, into a private cave. Complete with grubby clothes, hard hats, carbide lamps, flashlights, backpacks, sleeping bags, cooking stoves, food, drinking water and "P" pots (two five gallon buckets with lids for carrying out all waste and trash), the spelunkers enter an underground wilderness of mud hills, deep waterways, calcite growths, and utter darkness.

Ahead, the stream of water through which each student must walk, echoes its presence with a ferocity equal to the Colorado River. "This is not a normal cave," wrote Steve Caton, "this cave has cliffs to climb and water running in it." Caving ladders are set up to climb steep hillsides. Each climber is belayed up the hill with a climbing rope tied around his/her waist.

"From the top of a cliff where our first climb ended," wrote Kyle Boldt, " we slid down a big hill on our behinds. I went too fast and landed in the water," explained Kyrle Boldt.

Kyrle discovered he was not the only animal in the water. The spelunkers found frogs, salamanders, isopods, cave crickets, and bats. Bats are the most exciting finds! Students agreed, bats do look like a tiny mouse with wings! The bats, along with their droppings called guano, are the primary source of energy within a cave. The absence of light poses a problem for plant growth, but the guano nurtures strange molds and fungi to grow. Cave plants and rock formations create an eerie environment. Surely Tolkien got his ideas for The Hobbit and Lord of the Rings after exploring a cave! It was as though the explorers had been swallowed up by the Middle Earth in a fantasy land midway between sky and the inner core of the earth.

Firsthand learning is reinforcing classroom work. Earlier readings identified the formations that hang from the ceiling as stalactites (they cling tight to the ceiling). The formations on the floor of the cave are called stalgmites (one might step on them).

The exploration of The College School spelunkers takes them over rubbles of rock called breakdown. Eons ago the ceiling loosened, broke off, and fell to the floor of the cave.

Cave formations, or speleothems, hang from the ceiling, form upward from the floor, and flow over the walls. It's one thing to read about columns, rimstone dams, or cave grapes. It's quite another thing to see the calcium carbonate crystals delicately held on a water droplet at the end of a soda straw formation making a stalactite.

Each speleothem captures exploring minds in a whirlwind of thoughts and imagination. "As we walk through the cave," says Boyd Kleen, "I see more formations. The cave is like a tunnel with draperies and columns to the left and to the right like sinister figures standing in the shadows."

Shadows, or the lack of shadows, are awesome. Despite the strong impressions of water, rocks, and calcite formations, the overwhelming sensation is the absolute quality of darkness. Complete darkness does not allow the slightest shadow outline of a hand to be seen when the hand is held directly in front of the eyes. Peter Miller describes his impression of the darkness. "The darkness of the cave was like experiencing blindness. My mind imagines someone or something getting nearer with each plop of water dripping from the ceiling

If there were too much silence, I would clear my throat or sniffle just to make sure I was still there. Otherwise, I would tune my hearing in, anxiously waiting for someone to make a small noise so I knew they were near."

To further appreciate the absence of light, each spelunker, separated by distance, is given two birthday candles, a journal and a pencil. There is perhaps 15 or 20 minutes to write before the candles burn out.

Together, these students lived in the unfamiliar environment, becoming aware of the cave through all of their senses. For many, the cave awakened feelings never before experienced.

> "The brightness of the candle exploded in the darkness of the cave. In this silent darkness, with one small light, we wrote in our journal. I know that my candle will soon burn out and I will be left alone in the darkness." (Chris Kennedy, age 11)
>
> "If you listen to a cave, really listen, you can hear the beauty, like sounds of rain trickling on your roof, only a lot more powerful." (Mark Mouledous age 12).
>
> "You don't appreciate the sun until you go without it for a day or two. It's frightening. You lose track of time. You go to bed and wake up in the same darkness." (David Sheppard age 11)
>
> "Drip...drip...drip...darkness! The fast trickle of a stream underground, a cave." (Jennifer Jordan, age 11)

A cave is a delicate balance where nature must invest considerable time for any noticeable change to happen. Students who have gained an appreciation and an understanding of any natural community are more likely to be protective of that community and similar communities as well. It is important that students gain insight and respect for all wilderness areas.

The College School spelunkers have now emerged from the theme of "Caves and Crystallography" clean and dry, but the weekly cave immersions have stimulated some intense feelings. Students have acquired scientific knowledge and conservationist attitudes toward this fragile, underground wilderness, in their learning have read literature, seen movies of caves, and watched crystal grow. More Importantly, they know! Through their firsthand experiences they know the slipperiness of mud, the fragileness of formations, the incessant dripping of water, the absolute quality of darkness.

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JP:ks

Several years ago, I designed our present theme approach to education which includes appropriate field experiences and overnights. Theme work is done on Wednesdays and Thursdays for a quarter (about eight weeks) to facilitate two consecutive days where extended day trips or overnights can occur without disrupting the schedule of other kids and teachers. We have a Monday/Tuesday/Friday schedule that is more departmentalized while the Wednesday/Thursday schedule allows for full day, indepth theme work. I have been teaching in this integrated manner for eleven years now.

A thematic, or Theme, approach is the subject matter or content of study, such as Caves and Crystallography. Integration is taking the separate disciplines and combining them within the Cave subject matter. The experiential or adventure components include a visit to a cave a week, and two overnights, one of which is twenty-four hours underground.

A subject matter listing for this class includes the following:

Literature and Handouts:

Cave Ecology
Floyd Collins
Biology of a Cave
Cave Geology
Growing Seed Crystals
Growing Large Crystals
Six Months Alone in a Cave

American Caves and Caving
Adventure Underground
Life of the Cave
Mysterious World of Caves
The Caves Beyond
Beyond Time
Crystals

Movies:

The Dark Wilderness
Cave Ecology

Written Experiences:

What Is A Cave?
Using cave slides to produce moods
phrases
modifiers
Surveyers report on educational value of cave
Produce Haiku
Personal involvement with cave feature
Descriptive formation
Cave slide captions
Watery Impressions
Journal entries for overnight
Essay: "A Cave Is . . ."

Art Projects:

- Cave Silhouettes
  - combined with Haiku
- Map of Cave Interior
- Washes
- Silk Screen
  - Prints
  - Tee shirts
- Slide Prints
- Acetate with B/W ink
- Drawing of Cave Structure

Science Projects:

- Growth of crystals
  - Seed crystals
  - Large crystals
- Crystal shapes
- Crystal experiments
- Limestone Proof tests
- Cave temperatures
  - Entrance air
  - Air within cave
  - Water temperature
- Microscope study of crystals
- Crystal Garden experiment
- Food web of cave
- Study of bats
- Karst topography
- Sinkholes
- Formations and growth
- After imagery
- Effects of animal life

The theme is divided into two segments for the Wednesday/ Thursday time line. We visit a different type of cave each week on Wednesday. Thursday is divided into Science, Written expression, Art expression segments. Two overnights are included within the Theme. One is an overview of a private research cave and the other is an adventure underground for twenty-four hours. There are 17 students in the class with two adult leaders.

What Is Your Cave IQ?

1. What state leads the United States in the number of caves?
   R) Colorado M) Tennessee C) Missouri

2. The formations hanging from the ceiling are called
   A) stalactites E) stalagmites U) rimstone dams

3. A creature that forever dwells within the dark zone is called a
   D) isopod V) troglobite W) speleothem

4. The mineral deposit that creates the cave formations is
   O) copper sulfate I) potassium permanganate E) calcium carbonate

5. What group of students are becoming experts on caves, their formations, creatures, and conditions?
   S) Students from The College School
   S) Students from The College School,Adventure Education Class
   S) Students from The College School,Adventure Education Class on Caves

The Cave IQ questions, answered correctly, spell out the theme of this article, C-A-V-E-S.